REMARKS

This amendment is submitted in an earnest effort to bring this application to issue without delay.

Applicant has amended claims 13, 14 and 16, and canceled claim 15. Claims 18 and 19 which are method claims stand withdrawn. Antecedent basis for the amendments to claims 13, 14 and 16 may be found in Figures 1 and 2, especially in the following elements: crude product gas outlet (9), vertical annular wall (10), annular chamber (11), horizontal partition (12), separator outlet (14), separator inlet (15), and a lower solids opening in the separator (16). Thus claims 13, 14, 15 and 17 are now in the case and are presented for examination.

Applicant reserves the right to file a divisional application to cover the subject matter of the method claims.

Applicant believes that all claims now presented are patentably distinguishable over any combination or subcombination of the PRIESTLY , MAYERS, ANGELL, and FLESCH et al references.

MAYERS discloses a reactor (12) with a hopper (13) at its base filled with a bed of finely divided inert material (11) in which finely divided solid carbonaceous fuel is introduced below the upper surface thereof. Initially the material making up the bed may be ash from the fuel to be burned, or a relatively inert material such as alumina or silica. In any event a non-combustible material is chosen that has a softening point at air at least as that of the ash of coal to be used. The inert material is of a particle size to permit fluidization of the bed (col. 1, line 68

to col. 2, line 9). A fluidizing air stream produced by a rotary compressor (14) is introduced through line (10) into the hopper (13) and flows upwardly into the reactor (12) and through the bed (11) (col. 2, lines 19 to 22). With the bed in a fluidized condition the finely divided carbonaceous fuel is introduced below the upper surface of the bed (1) through a feeder (15). The fuel is introduced at a rate such that the bed (11) is predominantly inert material, containing only a minor portion of the solid fuel. The intense agitation of making up the fluidized bed effects the complete mixing of fuel and inert material, and the fuel is dispersed substantially uniformly throughout the bed (col. 2, lines 27 to 39). Since combustion takes place in the bed containing a major portion of inert particles, the fluidized bed provides an effective ash filter, and the hot gas collecting near the reactor discharge contains substantially less entrained ash compared with direct burning of pulverized fuel. Nevertheless, the hot gases rising frm the fluidized bed will entrain some ash dust, which may be separated by cyclone separators (16) positioned in the upper part of the reactor near the discharge and fall back into the fluidized bed (col. 2, line 72 to col. 3, line 9). The rate at which fuel is fed and ash or inert material removes from the bed are substantially the same. The fuel particles are burned to dry ash particles, which ultimately replace the original inert material supplied to the bed at start-up (col. 2, lines 56 to 62).

PRIESTLEY discloses a fluidized bed reactor (10) for carrying out the incineration of waste matter in the reaction

chamber (15) in which the waste material is fed by a feed hopper (26). A plurality of fuel guns (31) penetrate the vessel wall (11) for furnishing fuel to the reaction chamber (15). The exhaust gas and solids recycle system (35) are externally mounted. This external mounting is contrary to the features described in Figures 21 and 2 of the present application and specifically covered in new claim 14 where the discharge duct extends horizontally from the annular chamber On the top or at the side (col. 4, lines 9/10) of the fluidized bed reactor (10) comprises a pair of cyclones (39,41), each with its solid discharge conduit (43,44) and its gas conduit (46,47). The exhaust conduit (37) leading from the reaction chamber (15) communicates with cyclone inlets (38). The cyclone solids discharge conduits penetrate the reactor roof (42) and extend into the reactor chamber (15) (col. 2, lines 21 to 51). In operation the blower (21) fluidizes the sand bed provided in the reaction chamber (15) resting on the constriction plate (18) and fuel is introduced by fuel guns (31) and is ignited. Afer reaching the operation temperature waste matter is introduced into the reaction chamber (15) into a dilute fluidized bed consisting of a more dilute fluidized bed (54) in the upper part of the reaction chamber (15) and a denser fluidized bed (53) in the lower part of the reaction chamber (col. 2, line 59 to col. 3, line 12). The solids in the exhaust gases (sand particles and ash) would carry away a great deal of heat from the reactor vessel (10) and this heat loss would render the operation uneconomic. Therefore the gases with the solids carried therein are conducted to the cyclones

(39,41) for separation of the gas from the solids, which are returned to the reaction chamber through conduits (43,44) and thereby the heat contained therein is largely conserved.

MAYERS discloses a combustor (12) for combustion (col. 1, line 17 to 20) granular fuels. Coal or other carbonaceous fuel is burned in a fluidized bed (11) in the combustor (12) (col. 1, lines . 41 to 45). The fuel in the 'bed is burned in the air passing through the bed so that all stages of its consumption are represented in the bed. The combustor (12) is connected with coal bunker (Fig.1) for holding the granular fuel via a feeder (15) for feeding the granular fuel below the upper surface of a fluidized bed (11) of finely divided inert material in the combustor (12) (col. 2, lines 27 to 31). A fluidizing air stream (oxygen containing gas) is introduced through line (10) via a hopper (13) into the combustor (12) and flows upwardly through the fluidized bed (11). The combustion of carbonaceous fuel in the presence of air produces a gas containing carbon monoxide, carbon dioxide, water and soot but no hydrogen. The hot gases rising from the fluidized bed entrain some dust. At least one common centrifugal separator (16) is arranged above the surface of the fluidized bed (11) for separating the dust (col. 3, lines 15 to 9). Mayers discloses carbonaceous fuel is initially ignited by external means to initiate the combustion and burns within the bed and as combustion and fluidizing medium compressed air is introduced through line (10) into the hopper (13) above its base and flows

upwardly into the combustor (12) and through the bed (11) (col.2, lines 19 to 22).

PRIESTLEY teaches a fluidized bed reactor (10) for the incineration of waste matter (col. 1, lines 4 to 6) wherein fuel (but no gasification medium) is furnished to the reactor chamber (15) via fuel guns (31) penetrating the vessel wall. In the fluidized bed the waste material is completely burned (col. 4, lines 36 to 38).

MAYERS discloses the combustion of solid carbonaceous fuel in a fluidized bed of inert particles for producing a hot gas stream suitable for use as the work medium for a gas turbine, wherein the air flows in co-current configuration with the fuel, PRIESTLEY describes the incineration of waste matter by addition of fuel into the fluidized bed through which the air and the fuel flows in co-current configuration. The present application refers to a reactor for the gasification of granular fuels forming a fixed bed in which a mixture of oxygen-containing gasification medium, preferably steam, oxygen and/or air, is introduced for producing a gas containing hydrogen and carbon oxides as main components. The granular fuel is added to the fixed bed from the top. In case the granular fuel is too fine-grained a disturbingly large amount of the fine grained particles of the granular fuel is withdrawn from the reactor by the produced gas and transported into the subsequent apparatuses. The withdrawn fine-grained particles are fuel particles and no ash particles. The precondition for

withdrawing the fine-grained particles from the fixed bed is the partially embedding of the centrifugal separator in the fixed bed through which the gasification agent flows in counter-current configuration to the granular fuel added to the fixed bed from the top of the reactor. FLESCH et al discloses the combination of gasification of solid fuels of a wide range of particular sizes (a) in a fixed bed gasification zone (F), (b) in a fluidized bed gasification zone (VV) and (c) in a dust gasification zone (S) in a single reactor (G) (col.7, lines 31 to 38). Fuel in the form of lumps, granules and dust is fed from the store (12) into the fluidized bed zone (W) through the inlet (10). The portion unsuitable for the fluidization (lumps) fall downwards in the reactor (G) in the fixed bed zone (6 where this portion is gasified in counter-current with the gasification medium injected under the fixe4ed. The granular portion of the fuel fed directly into the fluidized bed zone (W) is gasified therein while the dust portion of the fuel rises into the dust gasification zone (S) above the fluidized bed zone (V/), where these portions are gasified in co-current with the gasification medium. The gasification and degasification products generated in the fixed bed zone (F) reach the fluidized bed zone (W) and acts as a fluidization and gasification medium together with the gasification medium fed from the outside directly into the fluidized bed (W) through feed pipes (14) (col. 4, lines 28 to 54). FLESCH et al does not disclose a cyclone separator for separating the dust as described by MAYERS.

The differences between combustion, incineration and gasification consist in that combustion or burning is a complex sequence of chemical reactions between a fuel and an oxidant accompanied by the production of heat, carbon dioxide and water; incineration is a solid waste treatment technology involving combustion of waste at high temperatures converting waste materials into heat, gas and residual ash; and gasification is a process that converts carbonaceous materials into carbon oxides and hydrogen.

It is an indispensable condition of the reactor of the present application to position the centrifugal reactor at least with its lower part in the fixed bed for separating fine-grained fuel particles from the product gas. According to claim 14, now presented, the discharge duct <u>extends horizontally from the</u> annular chamber. This feature structurally distinguishes the reactor of claim 14 from the reactors disclosed in PRIESTLEY, MAYERS and FLESCH et al, all of which requiring that the discharge duct extend through the top of the reactor or in the case of PRIESTLEY, there is an entire apparatus onto itself that is placed above the reactor for handling the discharge of the gases. Among the cited references only ANGELL discloses a reactor with a horizontal outlet 26,27 for fluid conversion products extending from the annular compartment.

Applicant now would like to concentrate on the structure of the presently claimed reactor and how the structure of the presently claimed reactor is patentably distinguishable over the combination of prior art references cited by the Examiner.

Applicant has disclosed and is now claiming a reactor that contains both a horizontal partition (12) and vertical walls (10) which are now clearly defined in independent claim 13. None of the cited references, however, individually or collectively, discloses or suggests a reactor with these particular structural elements. The ANGELL references comes the closest and discloses a particular conically shaped element 4, which is defined in col. 1, lines 53 to 55 as an intermediate partition 4 of inverted substantially conical form which divides the vessel into a lower compartment comprising the reaction zone 5 and an upper compartment comprising the regeneration zone 6. Attached to the conically shaped partition is a horizontal manifold not given a number, but through which has outlets 24 from the cyclone separators pass. The ANGELL reactor discloses a complex fluidized bed reactor with a catalyst bed in the lower compartment (reaction zone) and a second catalyst bed in the upper compartment (regeneration zone) with the intermediate conical partition separating the two zones. Applicant's fixed bed reactor has no such catalytic zones and does not need or use any kind of conical partition that is the same or structurally similar to the ANGELL partition. In other words the ANGELL reference does not disclose or suggest a reactor having within its casing vertical annual walls as required by all claims now presented, and as shown in Figures 1 and 2 by element 10.

The Examiner takes the position in paragraph 4 on page 5 of the office action that the ANGELL conical partition 4 actually includes vertical annual walls. The Examiner characterizes this

element as an <u>inclined, vertical annular wall</u>. How can a wall be both inclined and vertical at the same time? Either the wall is vertical or the wall is inclined. The two are mutually exclusive. Applicant submits that the wall that shapes the conical partition 4 in ANGELL is inclined, but is not vertical, and is therefore sharply structurally distinguishable from the vertical annular wall disclosed and claimed in the present reactor.

Since the ANGELL reference discloses a conical partition with its apex pointed downwardly, in the shape of a funnel with a tube extending downwardly from the apex, with inclined sides characteristic of a conical element, and does not disclose any <u>vertical</u> annular walls, no combination of the cited references discloses or suggests the presently claimed invention. The structure of the ANGELL conical partition even in combination with the horizontal manifold is far removed from the structure of the vertical annual wall 10 in combination with horizontal partition 12 and therefore no rejection of any claim should be maintained as obvious under 35 USC 103.

There is yet one more point that Applicant wishes to raise to establish that the presently claimed reactor is structurally distinguishable from any of the reactors disclosed in the cited prior art references. Claim 13 now presented requires as an element of the apparatus, a means including a reservoir holding the granular fuel and opening into the casing <u>within the annular wall</u> for forming in the casing <u>below the partition</u> a <u>fixed bed</u> of the granular fuel having an upper surface <u>spaced below the</u>

partition. No such means is either disclosed or suggested in any of the cited prior art references. Thus no claim now presented should be rejected as obvious under 35 USC 103.

Applicant believes that all claims now presented are in condition for allowance and a response to that effect is earnestly solicited. Applicant is enclosing a petition to obtain a one month extension of the term for response and the fee for obtaining the one month extension of the term for response may be charged to the credit card of the undersigned attorneys. The undersigned encloses a completed PTO Form 2038 to facilitate payment by credit card.

Respectfully submitted,
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Enclosures: Petition and PTO 2038